

In The Claims:

Claim 1. (currently amended)

An over-voltage crowbar for lightning surge and ESD protection comprising:

a Zener diode, providing an over-voltage threshold under an over-voltage condition;

a clamping transistor, having a drain coupled to an input voltage so as to clamp the input voltage when the input voltage is higher than said over-voltage threshold;

a mirror amplifier, responsive to the input voltage for generating an amplified voltage to drive the clamping transistor in response to the over-voltage condition, wherein the input voltage is coupled to an input of the mirror amplifier through said Zener diode, and an output of the mirror amplifier is connected to a gate of said clamping transistor;

two resistors, connected from the ground to said input of said mirror amplifier and said gate of said clamping transistor respectively for turning off said mirror amplifier and said clamping transistor in a normal operation condition; and

a speed-up capacitor, accelerating a response time of said mirror amplifier.

Claim 2. (currently amended)

The over-voltage crowbar in accordance with claim 1, wherein said mirror amplifier comprises:

an n-transistor, having a gate coupled to said input of said mirror amplifier and a source connected to the ground;

a first p-transistor, having a drain, a gate and a source; and

a second p-transistor, having a drain coupled to said output of said mirror amplifier, a gate coupled to said drain and said gate of said first p-transistor, and a source coupled to said source of said first p-transistor and to the input voltage to form an amplifier for providing the amplified voltage to drive said clamping transistor in

response to the over-voltage condition.

Claim 3. (currently amended)

The over-voltage crowbar in accordance with claim 42, wherein said speed-up capacitor is connected from said gate of said second p-transistor to the ground.

Claim 4. (currently amended)

The over-voltage crowbar in accordance with claim 42, wherein said speed-up capacitor is connected between said source and said drain of said second p-transistor.

Claim 5. (currently amended)

An over-voltage crowbar for lightning surge and ESD protection comprising:
a plurality of transistors, connected in series to provide an over-voltage threshold under an over-voltage condition;

a clamping transistor having a drain coupled to an input voltage so as to clamp said input voltage when said input voltage is higher than said over-voltage threshold;

a mirror amplifier responsive to said input voltage for generating an amplified voltage to drive said clamping transistor in response to said over-voltage condition, wherein said input voltage is coupled to an input of said mirror amplifier through said transistors, and an output of said mirror amplifier is connected to a gate of said clamping transistor;

two resistors connected from the ground to said input of said mirror amplifier and said gate of said clamping transistor respectively for turning off said mirror amplifier and said clamping transistor under a normal operation condition; and

a speed-up capacitor accelerating a response time of said mirror amplifier.